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No. 74—1917.

British Engineering Standards Committee

Formed in 1901 by

THE INSTITUTION OF CIVIL ENGINEERS.
THE INSTITUTION OF MECHANICAL ENGINEERS.
THE INSTITUTION OF NAVAL ARCHITECTS.
THE IRON AND STEEL INSTITUTE.
THE INSTITUTION OF ELECTRICAL ENGINEERS.

BRITISH STANDARD SPECIFICATION FOR CHARGING PLUG AND SOCKET FOR VEHICLES PROPELLED BY ELECTRIC SECONDARY BATTERIES.

REVISED, SEPTEMBER, 1917.

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BRITISH

STANDARD SPECIFICATION

FOR

CHARGING PLUG AND SOCKET

FOR

VEHICLES PROPELLED BY ELECTRIC SECONDARY BATTERIES.

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OF THE

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The Sub-Committee has been assisted in the preparation of this Specification by Mr. Frank Ayton, Honorary Secretary of the Electric Vehicle Committee of the Incorporated Municipal Electrical Association.

* President, British National Committee.
† Hon. Sec., British National Committee.
‡ Also nominated by the Institution of Electrical Engineers.

PREFACE TO FIRST EDITION.

The Sub-Committee on Electrical Accessories was appointed at the meeting of the Sectional Committee on Electrical Plant (reorganised in June, 1914, as the Sectional Electrical Committee) held on 15th January, 1903, which appointment was confirmed by the Main Committee on 8th December, 1904.

The great importance to the Electrical and Motor Vehicle industry of standardising the Charging Plug and Socket used in connection with vehicles propelled by secondary batteries was brought to the notice of the Engineering Standards Committee by the Electric Vehicle Committee of the Incorporated Municipal Electrical Association in March, 1914. In October of the same year certain proposals for the standardisation of a particular Plug and Socket, which the latter Committee had drawn up and based on the recommendations of the Electric Vehicle Association of America, were considered in detail. In order, however, not to depart from their guiding principle of interfering as little as possible with invention and progress, the Sub-Committee, after careful consideration, decided not to suggest, as standard, any detailed design, but to confine their attention to standardising only the essential points necessary to secure interchangeability between any Charging Plug and any Socket of the type selected by the Electric Vehicle Committee (viz., concentric), leaving to them the issue of a detailed Specification for the construction of the exact design of Plug which, in their opinion, is best suited to the present needs of the industry.

The Committee is indebted to the Electric Vehicle Committee for its cordial co-operation in this matter.

This Report was adopted by the Sectional Electrical Committee at their meeting held on 16th July, 1915.

This Report was approved by the Main Committee at their meeting held on 22nd July, 1915.

C. H. WORDINGHAM,

Chairman of Sub-Committee on Electrical Accessories.

PREFACE TO FIRST REVISION.

The Electric Vehicle Committee of the Incorporated Municipal Electrical Association invited the British Engineering Standards Committee to consider, and if possible to incorporate in this Report, a modification in the design of the Plug suggested by the Standards Committee (Electric Vehicle Division) of the Society of Automobile Engineers of America. It was pointed out that the proposed alteration added considerably to the mechanical strength of the Plug, and did not affect the standard dimensions necessary to secure interchangeability, but only the length of the steel shell of the Plug (*see* Appendix III.).

The Sub-Committee on Electrical Accessories at its meeting on 5th February, 1917, accepted the proposals of the Electric Vehicle Committee, and decided to recommend the adoption of this modification.

The Report was adopted by the Sectional Electrical Committee at their meeting held on 13th July, 1917.

The Report in its present form was approved by the Main Committee at their meeting held on 26th July, 1917.

C. H. WORDINGHAM,

Chairman of Sub-Committee on Electrical Accessories.

NOTE.—*The Committee desire to call attention to the fact that this Specification is intended to include the technical provisions necessary for the supply of the article herein referred to, but does not purport to comprise all the necessary provisions of a Contract.*

BRITISH STANDARD SPECIFICATION FOR CHARGING PLUG AND SOCKET FOR VEHICLES PROPELLED BY ELECTRIC SECONDARY BATTERIES.

[REVISED SEPTEMBER, 1917.]

Throughout this Specification the figures given in British measure are the Standard dimensions.

All Charging Plugs and Sockets for use on Circuits up to 120 Volts and for Currents not exceeding 150 amperes carried continuously or 200 amperes carried for one hour, and purporting to be British Standard, shall comply in every respect with the following requirements :—

PLUG PORTION.

Material of Shell of Plug.

1. The shell shall be of solid drawn mild steel or bronze tubing, in either case turned smooth on the outside to the dimension specified in Clause 2.

Diameter of Shell of Plug.

2. The outside diameter of the shell shall be $2\frac{3}{32}$ ins. (53·18 mm.)

Material of Main Contacts of Plug.

3. The main contacts shall be of gunmetal.

Size of Inner Main Contact of Plug.

4. The inner main contact shall have a diameter of 436 mils. (11·074 mm.) and this shall be tested by means of a "Go" gauge (*see* Plate I., Gauge No. 1) and a "Not Go" gauge (*see* Plate I., Gauge No. 3). It shall project $2\frac{1}{16}$ ins. (52·39 mm.) beyond the insulating support and be rounded at the end to facilitate entry into the socket.

Size of Outer Main Contact of Plug.

5. The outer main contact shall have an internal diameter of 1·407 ins. (35·738 mm.) and this shall be tested by means of a "Go" gauge (*see* Plate I., Gauge No. 1) and a "Not Go" gauge (*see* Plate I., Gauge No. 2). It shall project $1\frac{9}{16}$ ins. (39·69 mm.) beyond the insulating support and its inside edge shall be chamfered.

Concentricity of Main Contacts of Plug.

6. The inner and outer main contacts shall be concentric, and this shall be tested by means of a "Go" gauge (*see* Plate I., Gauge No. 1). They shall also be approximately concentric with the shell.

SOCKET PORTION.

Material of Shell of Socket.

7. The shell shall be made from solid drawn mild steel or bronze tubing, in either case turned smooth on the outside and bored to the dimension specified in Clause 8.

Diameter of Shell of Socket.

8. The internal diameter of the shell shall be $2\frac{1}{8}$ ins. (53·98 mm.).

Material of Main Contacts of Socket.

9. The main contacts shall be of gunmetal.

Size of Inner Main Contact of Socket.

10. The inner main contact, before it is slotted in accordance with Clause 12, shall have an internal diameter of 438 mils (11·125 mm.), and this shall be tested by means of a "Go" gauge (*see* Plate I., Gauge No. 4), and a "Not Go" gauge (*see* Plate I., Gauge No. 6*).

When the contact has been slotted in accordance with Clause 12 the internal diameter of the contact shall be reduced by closing in the walls to such an extent that the "Go" gauge (*see* Plate II., Gauge No. 9) shall enter easily, and the "Not Go" gauge (*see* Plate II., Gauge No. 10) shall not enter. These gauges (Nos. 9 and 10) shall be applied without pressure.

The depth of the centre hole shall be $2\frac{9}{32}$ ins. (57·94 mm.), and the inside edge shall be chamfered.

Size of Outer Main Contact of Socket.

11. The outer main contact, before it is slotted in accordance with Clause 12, shall have an external diameter of 1·405 ins. (35·687 mm.), which shall be tested by means of a "Go" gauge (*see* Plate I., Gauge No. 4), and a "Not Go" gauge (*see* Plate I., Gauge No. 5*).

When the contact has been slotted in accordance with Clause 12 the external diameter of the contact shall be increased by opening

* Gauges Nos. 5 and 6 should not be applied to the contacts of the socket after they have been slotted.

out the walls to such an extent that the contact shall enter the "Go" gauge (*see* Plate II., Gauge No. 7) easily but shall not enter the "Not Go" gauge (*see* Plate II. Gauge No. 8). These gauges (Nos. 7 and 8) shall be applied without pressure.

The outer main contact shall project $1\frac{13}{32}$ ins. (35·72 mm.) beyond the insulating support, and its outside edge shall be chamfered.

Size and Position of Slot in Main Contacts of Socket.

12. The main contacts shall each be slotted in four places on opposite ends of two diameters at right angles to each other. The width of the slot shall be $\frac{3}{64}$ in. (1·19 mm.).

The length of the slot in the inner main contact shall be $1\frac{9}{16}$ ins. (39·69 mm.) and in the outer main contact 1 in. (25·40 mm.).

Concentricity of Main Contacts of Socket.

13. The inner main contact and the outer main contact shall be concentric, and this shall be tested by means of a "Go" gauge (*see* Plate I., Gauge No. 4). They shall also be approximately concentric with the shell of the socket.

GENERAL.

Insulation of Main Contacts.

14. The main contacts shall be supported in the shell by means of insulating material of ample mechanical strength, and capable of satisfactorily withstanding heat and moisture. A tubular insulating shield shall be fitted between the inner and outer main contacts of the socket approximately concentric with these contacts (*see* Appendix III.).

Electrical Connection to Main Contacts.

15. Cable lugs shall be provided suitably proportioned to the size of cable recommended by the Wiring Rules of the Institution of Electrical Engineers for the current for which the plug is intended, but in no case shall the size be less than that suitable for carrying 150 amperes.

It is recommended that the lugs should be provided by the makers entirely, and not brazed, so that smaller sizes of cable may be used for vehicles the charging current for which is less than 150 amperes.

Cable Grip.

16. A suitable device shall be provided on the plug for gripping a three-core cable (two main conductors and one earthing conductor) having the charging conductors of the size recommended by the Wiring Rules of the Institution of Electrical Engineers for the current for which the plug is intended

Earth Connection.

17. An earthing contact shall be provided on the socket for connecting the shell of the socket to the shell of the plug. This shall be a sliding contact embodying means for taking up wear. The shell of the plug shall be provided with a cable lug suitable for an earthing cable equivalent to a 7/16 S.W.G.

Gauges.

18. Shop Gauges employed for the purposes of this Specification shall from time to time be checked against reference gauges (*see* Appendix I.). These reference gauges shall have been verified and their accuracy certified by the National Physical Laboratory.

Independent Tests.

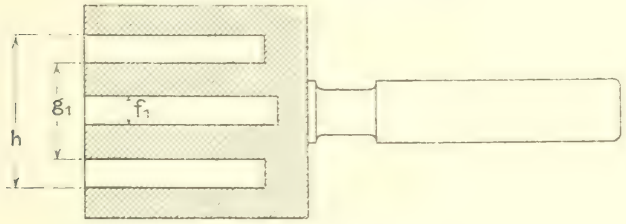
19. In the event of any difference between the representative of the Purchaser and the Manufacturer as to whether the article supplied is in conformity with all the requirements of this Specification, either party shall have the right to have tests carried out by an independent authority to be mutually agreed upon by the parties, or, failing such agreement, by the National Physical Laboratory. The expenses attendant upon such independent testing shall be borne by the party adjudged to be in the wrong.

BRITISH ENGINEERING STANDARDS COMMITTEE.

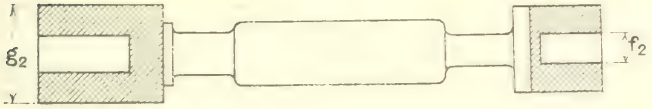
BRITISH STANDARD CHARGING PLUG AND SOCKET FOR VEHICLES PROPELLED BY ELECTRIC SECONDARY BATTERIES.

GAUGES FOR PLUG PORTION.

(For dimensions see Table, page 12.)



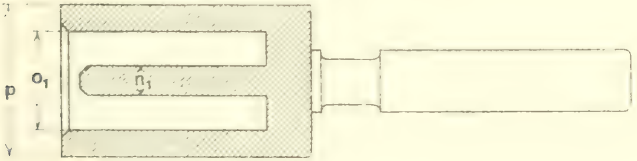
No. 1. "GO."



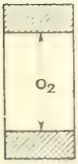
No. 2. "NOT GO." No. 3. "NOT GO."

GAUGES FOR SOCKET PORTION.

(For dimensions see Table, page 12.)



No. 4. "GO."



No. 5. "NOT GO." (MACHINE SIZE).

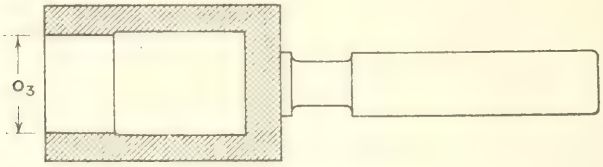
No. 6. "NOT GO." (MACHINE SIZE).

(The Diagrams are not to scale.)

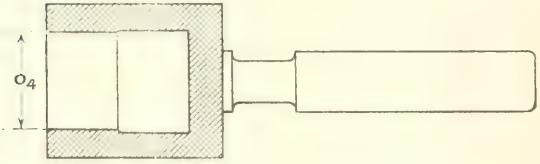
BRITISH ENGINEERING STANDARDS COMMITTEE.

BRITISH STANDARD CHARGING PLUG AND SOCKET FOR VEHICLES PROPELLED BY ELECTRIC SECONDARY BATTERIES.

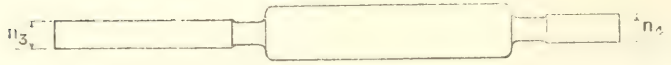
GAUGES FOR SOCKET PORTION—*(continued).*



No. 7. "GO." (SPRUNG SIZE).



No. 8. "NOT GO." (SPRUNG SIZE).



No. 9. "GO." (SPRUNG SIZE). No. 10. "NOT GO." (SPRUNG SIZE).

(The Diagrams are not in register to show the details of construction.

TABLE OF DIMENSIONS.

	Inches.	Approximate Metric Equivalents. mm.		Inches.	Approximate Metric Equivalents. mm.
f_1	0·437	11·100	n_4	0·422	10·719
f_2	0·435	11·049	n_1	0·427	10·846
g_1	1·406	35·712	o_1	1·406	35·712
g_2	1·408	35·763	o_2	1·404	36·662
h	2·110	53·594	o_3	1·421	36·093
n_2	0·437	11·100	o_4	1·416	35·966
n_3	0·439	11·151	p	2·115	53 721

APPENDICES.

Appendix I. -Standard, Reference and Shop Gauges.

Appendix II.--Notes on the Gauges for use in connection with this Specification.

Appendix III.--Relative Positions and Dimensions of Contacts.

APPENDIX I.

STANDARD GAUGES.

A Standard Gauge is a male or female gauge, having plain cylindrical surfaces suitable for depositing with the National Physical Laboratory for purposes of reference.

REFERENCE GAUGES.

A Reference Gauge is a male or female gauge, having plain cylindrical surfaces, and is intended for use by manufacturers and others for checking their own shop gauges. The reference gauges shall be verified and their accuracy certified by the National Physical Laboratory.

SHOP GAUGES.

A Shop Gauge is a gauge actually used in the shop for testing the dimensions of the article referred to in this Specification and checked from time to time against the reference gauges.

APPENDIX II.

NOTES ON THE GAUGES FOR USE IN CONNECTION WITH THIS SPECIFICATION.

The object of the gauges is to secure interchangeability between the plugs and sockets as well as accuracy of size and fit on the various contact diameters.

It is suggested that the forms indicated will be found convenient in practice, especially when dealing with the finished articles. For workshop use alone a somewhat simpler design may possibly be suitable for some of the gauges.

Only the dimensions required for gauging have been given in the table on page 12.

Gauges Nos. 1 and 4 are concentric gauges, of the nominal machined diameters of both plug and socket as regards the sizes of the portions designed to make contact, and with an allowance for clearance on the outside diameters. They serve to provide "Go" gauges for all the machined sizes, and also for the completed articles. When used for the latter purpose Gauge No. 4 will be a spring fit for the contacts of the socket.

Gauges Nos. 2, 3, 5 and 6 serve as "Not Go" gauges on the machined sizes. Of these, Nos. 5 and 6 are for the workshop only, and *must not* be applied to the contacts of the socket after the latter have been slotted. These two gauges are not necessarily required by an outside inspector, who may rely on the manufacturer in this respect.

The remaining gauges, Nos. 7, 8, 9 and 10, are "Go" and "Not Go" gauges for the "sprung" sizes of the socket main contacts. They must be used without any force, and, when so used, the "Go" gauges should enter, and the "Not Go" gauges should not enter the parts.

APPENDIX II.

RELATIVE POSITIONS AND DIMENSIONS OF CONTACTS.

The following illustrations show the relative positions of the main contacts together with a table of dimensions which include the limits upon which gauges have been designed in order to secure interchangeability.

PLUG PORTION. SOCKET PORTION.

Measure.	Inches.	Approximate Metric Equivalents. mm.	Measure.	Inches.	Approximate Metric Equivalents. mm.
A	2 3/8	60·33	J	2	50·80
B	1 9/16	39·69	K	1	25·40
C	13/16	20·64	L	1 1/8	28·58
D	2 1/16	52·39	M	3	86·52
E	5/16	7·94	N*	0·438	11·125
F	0·436	11·074	N†	0·425	10·783
G	1·407	35·738	O*	1·405	35·687
H	2 3/32	53·18	O†	1·419	36·042
I	1 13/32	35·72	P	2 1/8	53·98

* Machine Size.
† Spring Size.

British Engineering Standards Committee.

PRICE LIST

OF

BRITISH STANDARD SPECIFICATIONS AND REPORTS.

FEBRUARY, 1918.

(This List cancels all previous Lists.)

NOTE.—*Directly the necessary arrangements have been completed the Publications of the Committee, with a few exceptions, will also be issued in French, Italian, Spanish and Russian. Both the English Editions and the Foreign Translations will be published in octavo form, and will be available at 1/- net per copy or its equivalent in Foreign moneys.*

No.		Net.	Post free.
1	**Rolled Sections for Structural Purposes,** Lists of (REVISED DECEMBER, 1914)	2	2 3
2	**Tramway Rails and Fishplates,** Specification and Sections of ...	21 -	21 4
3	**Influence of Gauge Length and Section of Test Bar on the Percentage of Elongation,** Report on, by Professor W. C. UNWIN, F.R.S.	5/-	5 3
4	**Beams,** Properties of (included in No. 6)	1 -	1 2
5	**Locomotives for Indian Railways,** First Report on (Superseded by No. 50)	Withdrawn.	
6	**Rolled Sections for Structural Purposes,** Properties of ... ... This Publication contains Sizes, Areas, Weights, Moments of Inertia, Moments of Resistance, etc., for all Standard Sections of Structural Steel.	2 6	2 10
7	**Copper Conductors,** Tables of (REVISED MARCH, 1915) ...	5/-	5 4
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9	**Railway Rails,** Specification and Sections of Bull Head (REVISED JULY, 1909)	21/-	21 4
10	**Pipe Flanges,** Tables of	2 6	2 10
11	**Railway Rails,** Specification and Sections of Flat Bottom (REVISED JULY, 1906)	21	21 4
12	**Portland Cement,** Specification for (REVISED MARCH, 1915)	5 -	5 4
13	**Steel for Shipbuilding,** Specification for Structural (REVISED SEPTEMBER, 1914)	5	5 3
14	**Steel for Marine Boilers,** Specification for Structural (REVISED MARCH, 1907)	5 -	5 3
15	**Steel for Bridges,** etc., and General Building Construction, Specification for Structural (REVISED AUGUST, 1912)	5 -	5 4
16	**Telegraph Material,** Specification for	21 -	21 5
17	**Electrical Machinery,** Report on (Superseded by No. 72–1917) ...	Withdrawn.	
18	**Tensile Test Pieces,** Forms of (REVISED NOVEMBER, 1910)	Gratis	-/2
19	**Temperature Experiments on Field Coils** of Electrical Machines, Report on	10/6	10 10
20	**Screw Threads,** Report on (REVISED FEBRUARY, 1913)	2 6	2 10
21	**Pipe Threads** for Iron or Steel Pipes and Tubes, Report on (REVISED NOVEMBER, 1909)... ...	2/6	2/9
22	**Insulating Materials,** Report on the **Effect of Temperature** on ...	5 -	5 4
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34	**Screw Threads,** Tables of British Standard Whitworth, British Standard Fine and British Standard Pipe Threads (REVISED FEBRUARY, 1913)	Gratis	-/2
35	**Copper Alloy Bars** for use in **Automatic Machines,** Specification for	2/6	2/10
36	**Electrical Machinery,** Report on (Superseded by No. 72–1917)... ...	Withdrawn.	
37	**Electricity Meters,** Specification for (REVISED AUGUST, 1915)... ...	7/6	7/10
38	**Limit Gauges for Screw Threads,** Report on Standard Systems for (REVISED FEBRUARY, 1913)	5/-	5/4
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